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FOR THE

# CULTIVATION OF FLAX:

IN WHICH IS INCLUDED

SOIL AND ROTATION.
PREPARATION OF THE SOIL,
SOWING.

WEEDING. PULLING. RIPPLING. WATERING.
SPREADING.
LIFTING.
DRYING.
BREAKING AND SCUTCHING.

ALSO,

# A TREATISE

# ARTIFICIAL MANURES,

THEIR NATURE AND PROPERTIES,

ETC., ETC.

#### DUBLIN:

PUBLISHED BY PURDON, BROTHERS, 23, BACHELORS-WALK, PROPRIETORS OF THE IRISH FARMERS' GAZETTE,

TO THE PUBLIC—PRICE ONE SHILLING.
TO FARMERS—GRATIS.
1864.

FLAX PLANT

B 253 4244



# PRACTICAL INSTRUCTIONS

FOR THE

# CULTIVATION OF FLAX:

IN WHICH IS INCLUDED

SOIL AND ROTATION.
PREPARATION OF THE SOIL.
SOWING.
WEEDING.
PULLING.
RIPPLING.

WATERING.
SPREADING.
LIFTING.
DRYING.
BREAKING AND SCUTCHING.
THE COUNTRAL SYSTEM.

ALSO,

# A TREATISE

# ARTIFICIAL MANURES,

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FLAX PLAN

## TO THE FARMERS OF IRELAND.

The all-absorbing topic, the Flax Crop, and the consequent demand throughout Ireland for the necessary information respecting it, has induced us to issue, gratis, to the Farmers of Ireland, reliable instructions for its proper cultivation. These instructions were originally compiled by the Royal Belfast Flax Society, and recently revised by a Special Committee of the North-East Agricultural Society. We have also added to these Instructions important letters which appeared in the Irish Farmers' Gazette on the cultivation of Flax, written by men of long and successful experience, believing that in doing so, we place within the reach of our friends all that is necessary to be known on the subject; and as our first gratuitous issue of this Pamphlet will reach Ninety Thousand Copies, we trust that a corresponding amount of good may be effected.

We desire, at the same time, to call the attention of all, into whose hands this Publication may come, to the information it contains with respect to Artificial Manures, and especially to the well-known and highly appreciated Phospho Guano, which we were instrumental in introducing to the Farmers of Ireland some years back. This Manure has now attained such a high position in public estimation that it is quite unnecessary for us to add a single word to the testimony of its value in communications from many agriculturists of high standing, who, with the best results, have used it on all kinds of green and cereal crops. We caution Consumers against purchasing this Guano in bags not bearing the Company's Trade Mark.

W. S. & E. PURDON.

IRISH FARMERS' GAZETTE OFFICE, 23, Bachelor's-walk, Dublin, 1st January, 1864.

## PRACTICAL DIRECTIONS

FOR THE

# CULTIVATION OF FLAX.

#### SOIL AND ROTATION.

By attention and careful cultivation, good flax may be grown on various soils; but some are much better adapted for it than others. The best is a sound, dry, deep loam. It is almost essential that the land should be properly drained and subsoiled; as, when it is long saturated with either underground or surface water, a good crop need not be expected. The subsoiling should be executed the year of the green crop, so as to be completed at least two years before the flax is grown.

The best rotation is to grow after wheat, on average soils; but in poor soils, where wheat does not succeed, it is often better to grow after potatoes. Flax should on no account be grown oftener than once in five years; and once in seven, or even ten, is considered safer.

Any departure from this system of rotation is likely to cause loss and disappointment.

## PREPARATION OF THE SOIL.

One of the points of the greatest importance in the culture of flax is by thorough-draining, and by careful and repeated cleansing of the land from weeds, to place it in the finest, deepest, and cleanest state. This will make room for the roots to penetrate, which they will often do to a depth equal to one-half the length of the stem above ground.

After wheat, one ploughing may be sufficient on light, friable loam, but two ploughings are better; and on stiff soils three are advisable—one immediately

after harvest, across the ridges, and two in Spring, so as to be ready for sowing in the first or second week in April. Much will, of course, depend on the nature of the soil, and the knowledge and experience of the farmer. The land should be so well drained and subsoiled that it can be sown in flats, which will give more even and much better crops. But until the system of thorough-draining be general, it will be advisable to plough early in Autumn to the depth of six or eight inches. Throw the land into ridges, that it may receive the frost and air ; and make surface drains to earry off the rains of Winter. Plough again in Spring, three or four inches deep, so as to preserve the Winter surface for the roots of the flax. The Spring ploughing should be given some time before sowing, to allow any seeds of the weeds in the land to vegetate, and the harrowing in of the flaxseed will likely kill them, and save a great deal of after weeding. Following the last harrowing, it is necessary to roll, to give an even surface and consolidate the land, breaking up this again with a short-toothed or seed harrow before sowing, which should be up and down, not across the ridges, or anglewise. These operations can be varied by any skilful farmer, to suit peculiar soils or extraordinary seasons. The object is to have clean, fine soil, as like as possible to what a garden soil should be.

The rotation we recommend is-

|    | RICH SOILS.          | AVERAGE SOILS.           | POOR SOILS.              |
|----|----------------------|--------------------------|--------------------------|
| 1. | Grass.               | 1. Grass.                | 1. Grass.                |
|    | Oats.                | 2. Oats.                 | 2. Oats.                 |
|    | Flax.                | 3. Potatoes or Turnips.  | 3. Potatoes.             |
| 4. | Potatoes or Turnips. | 4. Wheat.                | 4. Flax (on half only*). |
|    | Wheat.               | 5. Flax (on half only*). | 5. Hay.                  |
|    | Clover Hay.          | 6. Clover Hav.           |                          |
|    | Pasture.             |                          |                          |

#### SOWING.

The seed best adapted for the generality of soils is Riga, although Dutch has been used in many districts of country for a series of years with perfect success, and generally produces a finer fibre, but not so heavy a crop as Riga. In buying seed, select it plump, shining, and heavy, and of the best brands, from a respectable merchant. Sift it clear of all the seeds of weeds, which will save a great deal of after trouble when the crop is growing. This may be done by furmers, and through a wire sieve, twelve bars to the inch. These sieves can be had in Belfast. Home-saved seed has produced excellent crops, yet it will be best, in most cases,

<sup>\*</sup> Omit flax on next rotation on this half.

to use the seed which is saved at home for feeding, or to sell it for the oil mills, The proportion of seed may be stated at one Riga barrel, or three and a half imperial bushels, to the Irish or plantation acre; and so on, in proportion, to the Scotch or Cunningham, and the English or statute acre, viz., about two and a half bushels for the Scotch acre, and about two for the statute acre. It is better to sow rather too thick than too thin; as with thick sowing the stem grows tall and straight, with only one or two seed capsules at the top; and the fibre is found greatly superior, in fineness and length, to that produced from thin sown flax, which grows coarse and branches out, producing much seed, but a very inferior quality of fibre. The ground being pulverised and well cleaned, roll, harrow, and sow. If it has been laid off without ridges, it should be marked off in divisions, eight to ten feet broad, in order to give an equable supply of seed. After sowing, which should be done by a very skilful person, as the seed is exceedingly slippery, and apt to glide unevenly from the hand, cover with a seed harrow, going twice over it, once up and down, and once across, or anglewise, as this makes it more equally spread, and avoids the small drills made by the teeth of the harrow. Finish with the roller, which will leave the seed covered about an inch, the proper depth. The ridges should be very little raised in the centre, when the ground is ready for the seed, otherwise the crop will not ripen evenly; and when land is properly drained there should be no ridges. Rolling the ground after sowing is very advisable, care being taken not to roll when the ground is so wet that the earth adheres to the roller.

#### WEEDING.

If care has been paid to cleaning the seed and the soil, few weeds will appear; but if there be any, they must be carefully palled; or cut with a knife, when the weeds happen to be larger or when potato stalks appear. It is done in Belgium by women and children, who, with coarse cloths round their knees, creep along on all fours. This injures the young plant less than walking over it (which, if done, should be by persons whose shoes are not filled with nails). They should work, also, facing the wind, so that the plants laid flat by the pressure may be blown up again, or thus be assisted to regain their upright position. The tender plant pressed one way soon recovers; but if twisted or flattened by careless weeders, it seldom rises again. The weeding should be done before the flax exceeds six inches in height.

#### PHILLING.

The time when flax should be pulled is a point of much nicety to determine The fibre is in the best state before the seed is quite ripe. If pulled too soon. although the fibre is fine, the great waste in scutching and hackling renders it unprofitable; and if pulled too late, the additional weight does not compensate for the coarseness of the fibre. It may be stated that the best time for pulling is when the seeds are beginning to change from a green to a pale brown colour, and the stalk to become vellow for about two-thirds of its height from the ground. When any of the crop is lying and suffering from wet, it should be pulled as soon as possible and kept by itself. So long as the ground is undrained, and imperfectly levelled before sowing, the flax will be found of different lengths. In such cases, pull each length separately, and, if possible, keep it separate in the pool. Where there is much second growth, the flax should be caught by the puller just underneath the bolls, which will leave the short stalks behind. If the latter be few, it is best not to pull them at all, as the loss from mixture and discoloration by weeds would counterbalance the profit. If the ground has been thoroughdrained, and laid out evenly, the flax will likely be all of the same length. It is most essential to take time and care to keep the flax even, like a brush, at the root ends. This increases the value to the spinner, and, of course, to the grower, who will be amply repaid by an additional price for his extra trouble. Let the handfuls of pulled flax be laid across each other diagonally, to be ready for the

## RIPPLING,

which should be carried on at the same time, and in the same field with the pulling. If the only advantage to be derived from rippling was the comparative ease with which rippled flax is handled, the practice ought to be adopted; but, besides this, the seed is a very valuable part of the crop, either for the oil mill or for feeding purposes at home. The apparatus is very simple. The ripple consists of a row of iron teeth screwed into a block of wood. It is to be taken to the field, where the flax is being pulled, and screwed down to the centre of a nine-feet plank, resting on two stools. The ripplers may either stand or sit

The best ripples are made of half-inch square rods of iron, placed with the angles of iron next the ripplers, 3-16ths of an inch asumder at the bottom, half an inch at the top, and 18 inches long, to allow a sufficient spring, and save much breaking of flax: The points should begin to taper 3 inches from the top.

astride at opposite ends. They should be at such a distance from the comb as to permit of their striking it properly and alternately. A winnowing sheet must be placed under them, to receive the bolls as they are rippled off; and then the ripplers are ready to receive the flax just pulled, the handfuls being placed diagonally, and bound up in a sheaf. The sheaf is laid down at the right hand of the rippler and untied. He takes a handful with one hand, about six inches from the root, and a little nearer the top with the other. He spreads the top of the handful like a fan, draws the one half of it through the comb, and the other half past the side ; and, by a half turn of the wrist, the same operation is repeated with the rest of the bunch. Some, however, prefer rippling without turning the hand, giving the flax one or two pulls through, according to the quantity of bolls. The flax can often be rippled without being passed more than once through the comb. He then lays the handfuls down at his left side, each handful crossing the other, when the sheaf should be carefully tied up and removed. The object of crossing the handfuls so carefully, after rippling, when tying up the beets for the steep, is, that they will part freely from each other when they are taken to spread out on the grass, and not interlock and be put out of their even order, as would otherwise be the case. If the weather be fine, the bolls should be kept in the field, spread on winnow-cloths, or other contrivance for drying; and if turned from time to time they will soon dry. Passing the bolls first through a coarse riddle, and afterwards through fanners, to remove straws and leaves, will facilitate the drying. If the weather be moist, they should be taken in-doors, and spread out thinly and evenly on a barn floor, or on a loft, leaving windows and doors open, to allow a thorough current of air, and turned twice a day. When nearly dry, they may be taken to a corn kiln (taking care not to raise it above summer heat), and carefully turned until no moisture remains. By the above plan of slow drying, the seed has time to imbibe all the juices that remain in the husk, and to become perfectly ripe. If it be taken at once from the field, and dried hurriedly on the kiln, these juices will be burned up, and the seed will become shrivelled and parched, little nutritious matter remaining. In fine seasons, the bolls should always be dried in the open air, the seed thrashed out, and the heaviest and plumpest used for sowing or crushing. The light seeds and chaff form most wholesome and nutritious feeding for cattle. Flax ought not to be allowed to stand in the field, if possible, even the second day; it should be rippled as soon as pulled and carried to the water as soon as possible, that it may not harden.

#### WATERING.

This process requires the greatest care and attention. River water is the best. If spring water must be used, let the pond be filled some weeks before the flax is put in, that the sun and air may soften the water. That containing iron or other mineral substances should never be used. If river water can be had, it need not be let into the pond sooner than the day before the flax is to be steeped. The best size of a steep pool is 12 to 18 feet broad, and 31 to 4 feet deep. Place the flax loosely in the pool, in one layer, somewhat sloped, and in regular rows, with the root end underneath; the tie of each row of sheaves to reach the root of the previous one; cover with moss sods, or tough old lea sods, cut thin, laid perfeetly close, the sheer of each fitted to the other. Before putting on the sods, a layer of rushes or ragweeds is recommended to be placed on the flax. especially in new ponds. As sods are not always at hand, a light covering of straw may do, with stones laid on it, so as to keep the flax just under the water; and as the fermentation proceeds, additional weight should be laid on-to be removed as soon as the fermentation ceases, so as not to sink the flax too much in the pool. Thus covered, it never sinks to the bottom, nor is affected by air or light. A small stream of water, allowed to run through a pool, has been found to improve its colour. It will be sufficiently steeped, in an average time, from eight to fourteen days, according to the heat of the weather and the nature of the water. Every grower should learn to know when the flax has had enough of the water, as a few hours too much may injure it. It is, however, much more frequently underwatered than over-watered. The best test is the following :- Try some stalks, of average thickness, by breaking the shove, or woody part, in two places, about six or eight inches apart, at the middle of the stalk; catch the broken bit of wood, and if it will pull freely out, downwards, for that length, without breaking or tearing the fibre, and with none of the fibre adhering to it, it is ready to take out. Make this trial every six hours after fermentation subsides, for sometimes the change is rapid. Never lift the flax roughly from the pool, with forks or graipes, but have it carefully handed out of the flax drain by men standing in the water. It is advantageous to let the flax drain twelve to twenty-four hours after being taken from the pool, by placing the bundles on their root ends, close together, or on the flat, with the slope; but the heaps should not be too large, otherwise the flax will be injured by heating.

The flax water can be either used as liquid manure for meadows, or kept in the pool till the first flood—it should not be run off into the river when the water is very low, as the odour is very unpleasant, and the water thus impregnated is poisonous to fish, and contrary to law. See Fisheries Act, 5 and 6 Vict., c. 106.

#### SPREADING.

Select, when possible, clean, short, thick pasture ground for this operation; and mow down and remove any weeds that rise above the surface of the sward. Lay the flax evenly on the grass, and spread thin and very equally. If the directions under the head of rippling have been attended to, the handfuls will come readily asunder without entangling. Some people recommend turning it on the grass with a long rod, which is not, however, generally done in Ireland.

#### LIFTING.

Six to eight days, if the weather be showery, or ten to twelve, if it be dry, should be sufficient on the grass. Ten days may be taken as a fair average in ordinary weather. A good test of its being ready to lift is to rub a few stalks from the top to the bottom; and when the wood breaks easily, and separates from the fibre, leaving it sound, it has had enough of the grass. Also when a large proportion of the stalks are perceived to form a bove and string, from the fibre contracting and separating from the woody stalk. But the most certain way is to prove a small quantity with the hand-break, or in a flax mill. In lifting, keep the lengths straight and the ends even, otherwise great loss will occur in the rolling and soutching. If heavy dews or damp weather prevail, don't lift after three c'clock, p.m. Let it be set up to dry for a few hours, and afterwards tie it up in small bundles; and if not taken soon to be scutched, it will be much improved by being put up in small stacks, loosely built, with stones or brambles in the bottom to keep it dry, and allow a free circulation of air. Stacks built on pillars would be best.

#### DRYING

By fire is always most pernicious. If properly steeped and grassed, no such drying is necessary; but to make it ready for breaking and scutching, exposure to the sun is sufficient. In some districts it is put to dry on kilns in a damp state, and is absolutely burned before it is dry, and the rich oily appearance of the flax is always greatly impaired.

#### BREAKING AND SCUTCHING.

If done by hand, try the Belgian system, which is considered superior to that practised in Ireland. If by milling, the farmer will do well to select those mills in which good machinery has been introduced; and it is to be hoped that ere long, by further improvements, increased economy in these establishments will be attained.

#### THE COURTRAL SYSTEM.

This mode of preparation requires to be very carefully executed, as inattention will reduce the value of the straw and yield inferior fibre. When made up for drying in large sheaves, the straw is much injured, the outside stalks being much discoloured by the heat of the sun before the inside of the sheaf is dry. The flax stems should be put together in bunches, about one-half larger than a man can grasp in one hand, spread a little, and laid on the ground in rows after each puller; the bunches laid with tops and roots alternately, which prevents the seedbolls from sticking to each other in lifting. It should be stocked as soon after pulling as possible, and never allowed to remain overnight unstooked, except in settled weather. The stocking should go on at the same time as the pulling, as, if flax is allowed to get rain while on the ground, its colour is injured. A welltrained stooker will put up the produce of a statute acre or more in good order in a day, with two boys or girls to hand him the bunches. The flax should be handed with the tops to the stooker. The handfuls, as pulled, are set up, resting against each other-the root ends spread well out, and the tops joining like the letter A. The stooks are made eight to ten feet long, and a short strap keeps the ends firm. The stooks should be very narrow on the top, and thinly put up, so that they may get the full benefit of the weather. In six or eight days at most after being pulled, the flax should be ready for tying up in sheaves of the size of corn sheaves. It is then ricked and allowed to stand in the field until the seed is dry enough for stacking. To build the rick, lay two poles parallel on the ground, about a foot asunder, with a strong upright pole at each end. The flax is then built the length of a sheaf in thickness or breadth. The bottom poles should be laid north and south, so that the sun shall get at both sides of the rick during the day. In building, the sheaves should be laid tops and roots alternately, built seven to eight feet high, and on the top a single row of sheaves, lengthwise, or across the others, and then another row as before, but the tops all the same way, which gives a slope to throw off rain; finish by putting on the top a little straw tied with a rope. In this way, if properly built, it will stand secure for months, or it can be put in a barn, if preferred ; in either case, the seed is to be taken off during the winter, and the flax steeped in the following May.

#### ADDITIONAL PARTICULARS.

In a letter addressed to the Farmers' Gazette, entitled "A Few Thoughts on the Cultivation and Management of Flax," the writer says :\_\_\_

"SIR,-I am glad to see that flax is likely to be far more extensively cultivated in Ireland than it has hitherto been, and that societies are being formed to carry out this great work. I call it a great work : because if small farmers in those districts where it never has been cultivated can be persuaded to grow flax, it will very soon appear how beneficial it will be to them.

"While I rejoice at anything introduced for the amelioration of my-country, yet I fear a failure in this if not judiciously managed; and if a failure at first, they are likely to discard it for ever; for such is the temperament of Irishmen that where they once fail you can scarcely get them to make a new trial. Now, to avoid this as far as possible, allow me to suggest a few things which I wish you to do, and which I have learned from long practical experience in the cultivation and management of flax; and should I give you one new idea on which your abler pen could enlarge, I shall be amply repaid.

"First, I would suggest that you publish a pamphlet, a guide to the small farmers of the south and west of Ireland, on the cultivation and management of flax, from preparing the ground until going to the mill. Let it be known by advertisement, that landlords may buy and circulate the pamphlet among the small farmers on their estates. By this guide they may be able to do much for its improvement. Now, as to land most suitable for growing flax : I disapprove of sowing flax after green crops under any circumstance. My reason for this is: I find, no matter how I prepare the ground and mix the manure in the drills with the spaces, yet there are still lumps of undecomposed manure embedded in the ground. The seeds falling on these grow luxuriantly; where they are not it grows shorter, so that we have an uneven crop. To an inexperienced eye the crop may all look well, but when it comes to the mill there is the loss. The scutchers take the streek by the end; all short flax below their hand is carried by the scutching knives into the show house, so that the loss is often very great. Again, if it should be attempted to sow flax after green crops, by no means should grass seeds be sown with it. It is incalculable the injury done by this system, without ever giving it a thought, that so far as the grasses reach up the stalk, excluding air and light, so far is the fibre weakened, and it will not stand the mill; but this can be remedied by not sowing the grass seeds until after the flax

is pulled. Nor should it be sown on wet or sour land; I have seen the effects of this also, and it was very bad indeed. And here I would say, is it not surprising that, after all that has been written through the columns of the Farmers' Gazette for more than twenty years, on the necessity of thorough draining, that so many thousands of acres remain yet undrained and unreclaimed?

"Land which I consider best adapted for growing flax is lea, or stubble after lea. This land gives a crop of an uniform height, and if it be shorter in growth (which I question), if the land be good there will be less waste in the mill. In ploughing this land for flax the furrows should be considerably narrower than usual for other crops. I never was more convinced than I have been this year that this kind of land is best for growing flax. I have a very respectable neighbour, who sowed on a piece of lea two bushels four quarts of flaxseed, the produce of which, I assure you, however incredible it may appear, was 64½ stones of 16½ lbs. He sold it for £31 10s., or over £50 per Irish acre. Besides, if the land is thought not strong enough for growing flax, it could be more evenly manured by sowing broadcast artificial manure. There is what is called flax manure, in which I have not faith; but I would certainly recommend Phospho Guano to be sown and ploughed in. I prefer ploughing it in to harrowing it in with or before the seed; in fact, both might be done beneficially, but flax roots go further for nourishment than many are aware of.

"The seed should be sown as early in April as possible, so as not to be injured by frost; the land when dry before sowing should be repeatedly harrowed and thoroughly pulverised, so as not a single arras can be felt. As the farmers will ascertain what quantity of seed they will require for what ground they have to sow, the better way will be to know how many quarts it contains, then count their ridges, and see how many times their number of ridges will go into their number of quarts; then by having a quart measure with them, they can give each ridge its share. This will cause them to sow it more evenly than otherwise; then let it be harrowed in evenly up and down, and rolled.

"Next comes the weeding. This must be carefully done when the flax is from four to six inches high; the weeding must be done by girls or boys barefooted. I allow no one with shoes on to go among it; my reason for not allowing shoes is, when they tread upon the young flax, pressing it against stones, be they ever so small, the flax is bruised, and never gets up again. During the interval between this and pulling, the dams should be made, three feet deep by eight to ten feet wide, the length according to the quantity of flax. As to the time of pulling, there are various opinions—some pull it green (in fact, I persuaded them before now to desist from pulling it in flower). They think by this that if they have it not in bulk, they have it in fineness of fibre. Now, I cannot agree with this, especially if it be carried directly to the water. I would not depend on it, even in linen. There must be some degree of maturity before it can be good; others, again, think when the leaves begin to strip off the stalk a very good time; others, again, when it begins to wear a golden hue: this I consider the best time of any.

"I need not say anything of the pulling and rippling: it is on the system you recommended many years ago I still work, as also your plan and size of rippling comb, only I prefer round iron to square iron. My reason for this is, if the men should inadvertently throw the handful too far into the comb, the stalk is not injured, as it might be by the square iron. The most convenient way of rippling here is to take a cart to the field, take off the wheels, and set it down on its axle : then tie the ripple board across the cart; a man stands at each end of the cart, so that two can ripple at one comb; as the cart fills, the bolls are put into bags; at night the wheels are put on again, and all drawn home. You must insist upon them to ripple their flax. Thousands of pounds worth of good, nutritious feeding go to loss annually by not rippling; and the rippling of any quantity of flax should pay all expenses from pulling until it goes to the mill. There are parties here who buy the bolls green from the ripple at 5d. per bushel; but the small farmers by this are taken advantage of; they could afford to give them much more for the bolls if they would. I find that from 6 to 7 bushels of bolls will yield one bushel of seed. This is bought in Belfast at from 6s. 6d. to 7s. per bushel; now this would pay the small farmer much better. The bolls are taken to the kiln, dried, then shelled by the mill, and cleaned by fans; the chaff is excellent for steaming with turnips for cattle or pigs. You could show them, too, the injurious effect of packing the dams too full when steeping. There must be room for the flax to move when fermentation sets in. Another thing I greatly object to-that is, keeping it under water with large stones. If this cannot be avoided, there should no stone be used that has been broken, having sharp edges; these chafe and cut the fibre, injuring it very materially. If small poles can be conveniently got, the better way is to plant posts at each corner of the dam, and along the sides, according to the length of the dam : to these posts nail a rail, the whole length of the dam on both sides; this rail mustbe six inches under water; when the dams are filled with flax, the poles to be

cut in lengths corresponding with the breadth of the dam; the ends of the poles are placed under those rails, over the flax. This will keep the flax six inches under water, without injuring it in any way. To those unacquainted with its management, it will be hard for them to know when it is sufficiently watered, or to guard against its remaining too long in the water. However, after fermentation subsides it must be carefully looked after, taking out occasionally a little of the flax from the centre of the dam: when they find this break freely by bending, then it is time to take it out. If the weather at this season be wet, I take it out a little under done; if dry, I allow it to be well done, as I can then lift it in a few days.

"Lifting flax off the grass should always be done after the dew is gone up, that it may be as dry as possible. There is great loss in sending damp flax to the mill, besides the danger the scutchers are in of having their hands drawn in under the knives. While I write, there are two here suffering severely with lacerated hands from this very cause. Flax is greatly improved by drying by artificial heat (hot water), even after being dried on the grass. Of course, it cannot be expected that small farmers can have any means of doing this; but they should build their flax in long, narrow stacks, in an airy place, for three weeks or a month before sending it to the mill. This will dry it considerably, and the yield will be greater.

"To save the movement from becoming abortive, landlords in those districts where it has not been cultivated should employ men able to instruct tenantry in every branch of the work—to move continually among them, and show them how to work it in each stage, from sowing the seed till it be converted into flax.

"I remain, yours, &c.,

" A. MOORE, Land Steward,

"Saintfield, County Down.

"March 25, 1862."

The following statement, forwarded by Leonard Dobbin, Esq., also appeared in the Farmers' Gazette:-

"SIR,—Will you allow me to send you a return made to me by Mr. James M'Aree, an intelligent tenant of mine, showing the produce of flax on part of his farm, in the County of Armagh, last year. I can vouch for its correctness.—Yours, &c., Leonard Dobbis, Gardiner's-place, March 26, 1863."

... £129 7 6

Flax grown in 1862, after a wheat crop, on James M'Aree's farm, in Lisdooney, near Tynan, Co.
Armagh, on 3½ acres, statute measure.

|                                       |             | ENSES.            |        |     |     |          |
|---------------------------------------|-------------|-------------------|--------|-----|-----|----------|
| One ploughing heavy furrow            |             |                   |        | £1  | 15  | 0        |
| Harrowing, rolling, and picking o     | ff weeds b  | efore sowing the  | seed   | 2   | 3   | 6        |
| Seed, 7 bushels                       |             |                   |        |     |     | 0        |
| Weeding                               |             |                   |        |     | 2   | 6        |
| Pulling, binding, drawing to water    |             |                   |        |     | 5   | 6        |
| Lifting out of water, drawing to      | grass, spre | eading, &c.       | •••    |     | 10  | 0        |
| Lifting off grass, stacking, &c.      |             |                   | •••    |     | 7   | 6        |
| Drawing to scutch mill                | •••         |                   |        |     | 0   | 0        |
| Scutching 168 stones of fibre         | •••         |                   |        | . 6 | 12  | 0        |
| m . 1                                 |             |                   |        |     |     | <u> </u> |
| Total expenses                        |             | •••               |        | £23 | 16  | 0        |
| Rent, 3a. 2r., at £1 5s. per acre     |             | •••               | £4 7 0 |     |     |          |
| County cess, two series<br>Poor-rates | •••         |                   | 0 8 5  |     |     |          |
| l'oor-rates                           |             |                   | 0 1 10 |     | 17  |          |
|                                       |             |                   |        | 4   | 11  | 0        |
|                                       |             |                   |        | £28 | 10  | 3        |
|                                       | nno         | DUCE.             |        | 220 | 10  | Ð        |
|                                       |             | DUCE.             |        |     |     |          |
| Sold 168 stones flax at 11s. 9d.      | per stone   |                   |        | £98 |     | 0        |
| Scutching tow                         | •••         |                   |        | 0   | 15  | 0        |
|                                       |             |                   |        |     | _   | _        |
| D 1                                   |             |                   |        | £99 |     | 0        |
| Deduct expenses, rent, &c.            | ***         | •••               | •••    | 28  | 13  | 3        |
| N-161                                 |             |                   |        |     | 7.5 |          |
| Net profit                            |             | ial to £20 per ac |        | £70 | 19  | 9        |
| \$6 10 I                              | acres, equ  | an to 220 per ac  | re.    |     |     |          |
|                                       |             |                   |        |     |     |          |

#### ON SAVING FLAX SEED.

As an instance of the advantage to be derived from the cultivation of flax, even as regards its seed, we quote the practical experience of Mr. Wolstenholme, who sowed 15 Irish acres with Dutch seed, four bushels to the acre. These 15 acres produced 345 bushels of excellent seed, which were sold to average 7s. 6d. per bushel:

Making

| Flax produce al  |                  | , 850 stones | of 14 lbs.    |            |     |      |    |   |
|------------------|------------------|--------------|---------------|------------|-----|------|----|---|
| To sentch at lea | ast              | 200 do.      |               |            |     |      |    |   |
|                  | -                |              |               |            |     |      |    |   |
|                  |                  | ,050 stones, |               |            |     |      |    |   |
| Or 6 tons 11     |                  | r which he   | has been offe | ered £60 p |     |      |    |   |
| amounting        | to               |              |               |            | ••• | £393 | 15 | 0 |
|                  |                  |              |               |            |     |      |    | - |
| Being for the fi | iteen Irish acre | s            |               |            |     | £523 | 2  | 6 |
| •                |                  |              |               |            |     |      |    | _ |
| Or, per acre     | ,                |              |               |            |     | £34  | 17 | 6 |

The average value of Irish flax may be at present estimated at from £45 to £50 per ton, so that instead of the flax having been injured by the saving of the

seed, the crop has, by good management, produced an article exceeding in value from 20 to  $33\frac{1}{2}$  per cent. beyond the average of the country.

Mr. Wolstenholme the following year sowed 40 Irish acres with flax, viz. :— 35 acres with seed of his own saving, 2 do. with Rign, and 3 do. with Dutch.

The seed of his own saving was sown three or four days after the foreign, but came up before it, a much stronger plant and thicker in the ground, although the same quantity of each was sown, and to this moment promises to be a superior crop.

Computing that 100,000 Irish acres are sown, and that the crop of seed be but 20 bushels per acre, and the price only 6s, for crushing, still the value of the seed crop would be £600,000; and if the crop of flax on 100,000 acres yielded only 7 cwt. per acre, or 35,000 tons, this quantity, at £45, would be £1,575,000; at £50, £1,750,000; and, therefore, the increased value, if at £60, by superior management, would be a further gain of from £350,000 to £525,000, thus making on the crop an annual increase of income of £1,000,000 or upwards from the flax crop in its present limited extent! But there can be little doubt that the increased stimulus which would be thus given, by the advantageous results of improved management in the cultivation of flax, would greatly extend its growth over the south and west of Ireland, where the soil is in many places admirably adapted for it: and as it has been clearly ascertained that flax is not an impoverishing crop, and, moreover, is peculiarly suited for laying down ground with clover, it does not appear unreasonable to suppose that the extent of land under it in this country may be more than doubled, and the national advantages derived therefrom proportionably increased.

It appears, in fact, but necessary that other landed proprietors should follow the example of the estimable and intelligent gentleman who has been referred to, and who assured the writer that he would have much pleasure in giving every information on the subject to those at a distance who might desire it: he has already kindly afforded persons in his neighbourhood the means of profiting by his example. Ireland, from the climate, soil, the abundance of water she enjoys, and the extent of her population, is probably better adapted than any other country for the cultivation of flax and the successful prosecution of the linen trade. If her sons do but their duty, she cannot but take the lead of all other nations in this important manufacture.

# TREATISE

ON THE

# NATURE AND PROPERTIES

# ARTIFICIAL MANURES:

CONTAINING

Nature and Properties of Phospho Guano.

Comparison of Peruvian Guano and Phospho Guano.

Comparison of the Phospho Guano with a mixture of Peruvian Guano and Superphosphate of Lime.

Baron Liebig's explanation of the difference between the action of Phospho Guano and the Peruvian Guano upon the soil and plant.

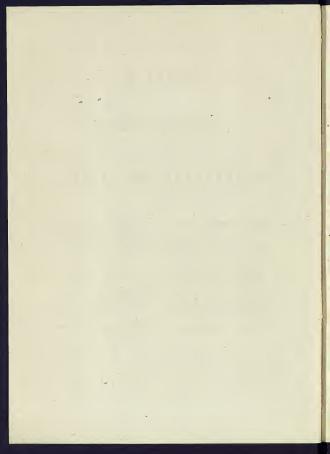
Commercial Value of Phospho Guano.

Commercial Value of Peruvian Government Guano, as stated by Thomson, Bonar, and Co., the new Contractors to the Peruvian Government.

Reply to the statement of Thomson, Bonar, and Co., by the Contractors to the Phospho Guano Company.

Agricultural experience of the difference between the Peruvian Government Guano and Phospho Guano.

Guano or Organic Phosphates versus Mineral Phosphates.



# ARTIFICIAL MANURE.

# Nature and Properties of Phospho Guano.

The Phospho Guano, in its natural state, is found on trap-rock islets within the tropics. It was discovered in 1854; and its existence was first made known to the public in August, 1856, when Dr. VOELCKER, Consulting Chemist to the Royal Agricultural Society of England, read a paper before the members of the British Association at Cheltenham, "On the remarkable composition of a new variety of Guano, called Columbian or Maracaibo Guano," pointing out its peculiar fitness as the base of a highly concentrated phosphatic manure. The specimens examined by Dr. VOELCKER were taken from Monk's Island, in the Spanish Main; but other deposits, still richer in phosphates, have since been discovered, from which the importations are now received. It is one of the most remarkable natural substances; and is so far singular from the fact of its containing an excess of phosphoric acid compared with any other known phosphate. The phosphate of lime existing in it contains one equivalent less of lime than is found in the phosphate of lime in bones, or other varieties of Guano. Hence the facility with which, by the aid of a comparatively small quantity of sulphuric acid, the phosphate of lime is converted into a soluble super-salt.

Phospho, Guano contains in its natural state nearly double the quantity of phosphoric acid found in bones and other substances from which Superphosphates are prepared. When imported, it is subjected to the action of sulphuric acid, to render the phosphates soluble; and a pure salt of ammonia is afterwards added, to supplement the quantity naturally existing in the raw Guano. On its original introduction, the ammonia in the Phospho Guano was supplemented by using a chemical preparation of Peruvian Guano; but this process was soon abandoned, owing to the great variation in the quality of Peruvian Guano, and the consequent trouble and uncertainty attendant on securing a uniform per centage of ammonia.

# Comparison of Peruvian Guano and Phospho Guano.

Dr. Anderson, Chemist to the Highland and Agricultural Society of Scotland, states that he has frequently analysed and examined the nature and properties of Pernyian Guano, and that he has found considerable difference in the composition of different cargoes of this Guano, having analysed samples differing in value to the extent of nearly £3 per ton. In some few exceptional cases he has found samples not worth more than two-thirds of the price of good Peruvian Guano. Extreme differences such as these are not frequently met with; but it is no uncommon occurrence to find differences of £1 or £2 per ton in the value of different cargoes of genuine Peruvian Guano. He has particularly adverted to this fact in his book entitled Elements of Agricultural Chemistry, published in 1860: and has always held that the system adopted by the importers, of selling all cargoes of Peruvian Guano at the same price, irrespective of quality, is inconsistent with true commercial principles, and disadvantageous to both buyer and seller.

LIEBIG states that Professor WAY, late Chemist to the Royal Agricultural Society of England, examined 78 samples of genuine Peruvian Guano, and that he found in 100 parts-

|                                       | Mean.   | Lowest.   | Highest.    |
|---------------------------------------|---------|-----------|-------------|
| Phosphate of Lime, &c                 | 22.78   | . 10.07   | <br>28.65   |
| Organic Matter and Salts of Ammonia ) | 52.05   |           |             |
| containing Nitrogen                   | (13.61) | . (11.17) | <br>(17.08) |

And that his experience enables him to testify to the general correctness of these analyses.

As the Phospho is the only Guano which enters into competition with the Peruvian Guano, it is of importance that the farmer should clearly understand in what degree the two Guanos differ.

The following extracts from the opinions, duly signed by the distinguished Agricultural Chemists\* -- APJOHN, CAMERON, HODGES, ANDERSON, VOELCKER, and LIEBIG, will explain, thus :-- .

1 .- "The remarkable deposit which constitutes the base of the manure called Phospho Guano " is a true Guano deposit.

DR. APJOHN, Chemist to the Royal Agricultural Society of Ireland, and Professor of Chemistry to the University of Dublin.

D. University of Distins.

D. University of Distins.

D. University of Distins.

D. University of Distins of Chemistry and Pablic Analyst, Dublin.

D. Alle May Processor Agreetium to the Quest's College, Bellated

D. ANDERSON, Chemist to the Highland and Agricultural Society of Scotland, and Professor of
Chemistry to the University of Calsarow.

D.R. YOLECKEE, Chemist to the Royal Agricultural Society of England.

BARON JUSTUS VOM LEIBLY, Tersidiant of the Royal Agademy of Sciences, Munich.

—" PHOSPHO GUANO contains nearly the whole of its nitrogen in the form of readily available salts of ammonia. Peruvian Guano, on the other hand, contains the larger proportion of its nitrogen in the form of uric acid, guanin, and other nitrogenous substances.

3 .- "Phospho Guano contains nearly double the amount of phosphate of lime which is found in

" Peruvian Guano.

.—"Nearly the whole of the phosphoric acid in Picostro GCaxo, amounting to about 12 per cent.

"(which is equivalent to about 42 per cent. of bone phosphate), occurs in a state in which it is easily
"soluble in water, whilst only a small portion of the phosphoric acid in Peruvian Guano occurs in such
"a soluble state."

5.— In Prostrio Guxo a large amount of soluble phosphate is combined with an appropriate, and fair proportion of amounds. In Pervirun Guno a mets mailler total amount of phosphates, and "compared with Prostrio Guxo, quite an insignificant amount of soluble phosphates, is associated with an excessive amount of amounds and ultracognous organic matters capable of yielding ammonia.

" on decomposition.

6.—"Direct experiments in the field, carried on for many years, have shown that highly nitrogenized manures, or of fertilizers containing more than 5 or 6 per cent, of ammonia, require to use with great caution, inasmach as such a proportion of ammonia in a manure is prejudicial when a heavy dressing of the manure is put upon the land. On some soils even less than 4 per cent, of an-"monia is calculated to do more harm than good, especially when used for turnips, carrots, and root "crops in general.

7.—"Field experiments, extending over a number of years, demonstrate that an excessive application of soluble phosphate like that found in the Piorsurio GVaxon over does harm, but invariably increases the fertility of the land. By using three or four times as much soluble phosphate as would be be emboved in practice on the most liberal dressing of a bosophate manure, no infury, but a most

"decidedly beneficial effect, is produced upon the crops under experiment.

8.— Such experiments are fully confirmed by the experience of farmers throughout the country. No one at all acquainted with agricultural chemistry and the experience and nages of the agricultural chemistry and the experience and nages of the agricultural chemistry and results of the state deliberately that a large dose of ammonia or of "nitrogenous organic matter may, and often dose, produce evil effects upon our farm crops; whereast he "most liberal application of a manure like the Phospho Goano, rich in soluble phosphates, is invariably "attended with the most beneficial results."

9.— Peruvian Gnano contains, in relation to its phosphatic constituents, an excessive proportion of nitrogenous organic matters yielding ammonia on decomposition; for which reason it is calculated to to harm when it is injuidationally used by the farmer. It cannot be advantageously used as a source of phosphates; hecanes whenever it is applied in quantity sufficient to supply an abundance of these "substances, the quantity of nitrogen becomes excessive, and is lable to produce injurious effects."

10.—"In Prioseno Guaro the proportion of phosphates is so adjusted that it can be used without if risk in very large quantities; and as the phosphates are by far the most important substances on most soils, it produces a good and profitable result in cases in which Pervarian Guano has comparatively

"little effect.

"Il.—"All these different facts, ascertained by scientific and practical field experiments, prove that
"it is to the favourable relation between the phosphates and ammonia, which makes it applicable as
"a manure in so many cases, that the rapid extension of the use of Phoseno Graxo is mainly due."

From the foregoing it will be seen that the radical defect of Peruvian Guano is the relative proportions in which ammonia and phosphate of lime exist in it. It has too much ammonia, and hence is too stimulating: it has too little phosphate of lime, and hence does not add to the fertility of the land. or return to it those indispensable mineral elements which repeated crops carry off. That its excess of ammonia induces an over-growth of soft straw and of shrivelled grain in the cereal crops, and of a superabundance of foliage and a soft, spongy bulb in

root crops, is becoming generally acknowledged. In fact, it does not accomplish one of the primary objects of manuring, viz., to improve the soil; but, on the contrary, exhausts it, and, by repeated injudicious use, impoverishes it.

The Phospho Guano, on the contrary, according to Dr. Voelcker, being "much richer in phosphates, and not containing so much ammonia as to cause too "luxuriant a development of leaves at the expense of the bulb, is much superior "to Peruvian Guano as a manure for turnips, swedes, mangolds, and potatoes."

Equally emphatic is the opinion of Baron Liebte, who says that the result of his researches prove, "that no manure has as yet come to his knowledge so rich in soluble phosphates, and other efficacious soluble ingredients;" also, that he has "never had in his hands a manure which, in regard to the best proportions and abundance of efficacious soluble component parts, was to be compared to the Phoseno Guano, and that the Phoseno Guano surpasses most certainly, by its more correct and constant composition, the best sorts of Peruvian Guano, and of its superior efficacy there cannot be the slightest doubt."

# Comparison of the Phospho Guano with a mixture of Peruvian Guano and Superphosphate of Lime.

Many farmers in this country are of opinion that as all the valuable elements of Phospho Guano are contained in Superphosphates and Peruvian Guano, it is much more economical to purchase these substances and mix them together. The fallacy of this has long been known to most farmers of intelligence; but there are still a large class, comprising agriculturists of considerable note, who maintain that such a mixture is quite equal in quality to the Phospho Guano, is more economical, and will produce as good results. This matter has consequently attracted the attention of the Baron Liebic; and the result of his investigation, which will be herewith found in detail, proves the extreme fallacy of such views. His general conclusions are, as will be seen by the Baron's report here quoted, that "in the Phospho Guano there is more than double the quantity of soluble phosphoric acid than in an equal weight of a mixture of half Peruvian Guano and half Superphosphate; and also that, by using Phospho Guano, the farmer conveys to his field 26 per cent or one-fourth more phosphoric acid than by a

mixture of equal parts of Peruvian Guano and Superphosphate of Lime;" and that "the advantage for the improved quality of the soil appears still more in favour of the Phosphor Guano, if the quantity of soluble phosphoric acid is taken into consideration."

The Baron says :-

"The quantity of nitrogen found in Peruvian Guano does not correspond to its equivalent of "ammonia. The richest in ammonia contains very seldom more than seven per cent.; \*the rest of the "nitrogen is in the form of wrice acid, quantin, &c., of the action of which on vegetation nothing is known.

"nitrogen is in the form of unc acid, guanth, etc., of the action of wincen on vegetation notating is known."

"Of late many framers employ with considerable success a mixture of Peravian Guano with
"sulphurle acid. But a mixture of superphosphate of lime and Peravian Guano has been found to be
"still better for the field, and more efficacious. This mixture is, however, in its turn far surpassed by
"the Proserno Guano."

"Such a mixture of equal parts, that is to say, 50 parts of Peruvian Gnano mixed with 50 parts of superphosphate of lime (containing 20 per cent. of total phosphoric acid) contains—

The mean of the analyses of the Phospho Guano shows that this manure contains in 100 parts-

| rts of<br>inper- |
|------------------|
|                  |
|                  |
|                  |
|                  |
|                  |
|                  |
|                  |
|                  |

"These figures above that in 100 parts of Prossure Grane the farmer conveys to his field 26 per cent, or one-court, phosphories acid move than by a mixture of 50 parts of Pecuvian Ganae and 60 "parts of superphosphate of lime. The advantage for the improved quality of the soil appears still move in favour of the Pincepro Guyaco, if the chamitty of solids phosphoric acid its taken into considerance or in favour of the Pincepro Guyaco, if the chamitty of solids phosphoric acid its taken into considerance.

"The superphosphate of lime in commerce does very seldom contain more than 12 per cent., and "most of them sold in England not above 10 per cent. of phosphoric acid in soluble state. The average "quantity of soluble phosphoric acid which I found in Peruvian Guano does not exceed 3 per cent.

"In a mixture of Peruvian Guano and superphosphate of lime there are

In 50 parts of Peruvian Guano.....1.5 Iu 50 parts of superphosphate ......6.0

"In 100 parts of Phospho Guano are 19.537 parts of phosphoric acid, of which 18.027 are "easily soluble."

"Consequently, in Phospho Guaxo there is more than double the quantity of soluble phosphoric
"acid than in an equal weight of a mixture of half Peruvian Ganao and half superphosphate of lime,
"These figures establish, as Yverly believe, the high value of the Proserro Guaxo."

# Baron Liebig's explanation of the difference between the action of Phospho Guano and Peruvian Guano upon the soil and plant.

"Careful investigations have recently proved that the exaile acid has a share in the efficacy of "Peruvian Guano, insumenh as by its means a part of the phosphoric acid becomes soluble, and thus is "spread in the soil. Peruvian Guano, therefore, produces as effect much more specifiy than where "Ganaos; and the favour it enjows with agriculturists is owing chiefy to the quick diffusion of the

" phosphoric acid contained in it.

"What the oxalic acid effects for the Peruvian Guano, is more perfectly attained in the Proseno
"Guano by the sulphuric acid, which is added to it in the process of preparing it for the use of the
"farmers.

"It is possible to form a mixture of soluble Guano phosphates with ammonia salts, not only in the "proportion in which they exist in Peruvian Guano, but in far better and more favourable proportions,

"as is practically demonstrated in the case of the Phospho Guano.

"As to the cause of the efficacy of Guane, opinion was for a long time divided. At first it was "As to the cause of the efficacions effect was owing to the Ammonia, or the amount of nitrogen which the "Guane contained; and hence that from Pern, which was richer in nitrogenous elements, commanded

" a higher price than the other sorts, which were not so rich in them.

"The experience gained in England, Germany, and other countries has now, however, proved it that it was an error to believe that the efficiency of the Pervina Guano resulted chiefly from the "amount of nitrogen it contained. On the contrary, the greater number of fields manner with Pervina Ganon bave shown that, by the employment of this manner, very much more nitrogen is imparted to "the field than is good for it, and that the excess of nitrogen the farmer thus conveys to the soil highers his fields, and unfits them for the culture of turnips and folder plants. Many agriculturists, who at "first highly landed the Pervina Guano as the best manure, employ it now no longer; others but in "amiler countrities."

"Very different is the estimate which experience has taught as to form of manuros rich in phose "phor'o acid, as the Proseno Grazo. These, as their application in all countries has shown, are the "most nocessary for the restoration of a field, and for increasing its crop. Their effect is sure, and "the fields to which they are applied are bettered lastingly. From this point of view, it is now, I think,

" very casy to get a correct idea of the value of the Phospho Guano."

## Commercial Value of the Phospho Guano.

The most eminent Agricultural Chemists have ceased to place a money value on manures submitted by them to analysis, as tending to lead to erroneous conclusions, owing to the disingenuous manner in which such values are sometimes paraded before the public eye by dealers; but for the information of those farmers who still have faith in this test, we may state that the money value of the Phospho Guano, calculated by the data hitherto in use by these Chemists, is, according to their mean average, above £14 per ton.

These figures show, by the only accepted test of money value, that the Phospho Guano is sold to the farmers at a price considerably below its commercial value, calculated according to the usual method. It must be borne in mind,

however, that this estimate of the money value of Phospho Guano, founded upon its chemical composition, has been arrived at by valuing its ingredients at the same rate as if they were the elements of the most inferior kind of manure. But this valuation of the Phospho Guano, high as it is, does not indicate the actual practical value of the Guano, which, indeed, is far greater than its mere analysis expresses; for the phosphates in Guano are of far more value than equal weights of the same ingredients in bones; while the fertilizing constituents of bone superphosphate are, weight for weight, more valuable than the same ingredients in coprolite and other mineral superphosphates. It was at one time believed that soluble phosphate from every source is equally valuable; but very recently, Dr. VOELCKER, in the Journal of the Royal Agricultural Society of England (Vol. xxiii.), exposes the fallacy of this. He says:—

"The fact is, the commercial value of soluble phosphate of lime, like that of many other materials, of depends in some measure on the source from where it is derived, and the nature and the amount of "other substances with which it is a from the produced the phosphates common by produced to the produced of the produced and the produced of the produ

## Commercial Value of the Peruvian Government Guano.

The attention of the reader is desired in the careful perusal of the following Advertisement by MESSRS. THOMSON, BONAR, and CO.—the new Contractors to the Peruvian Government—issued through the medium of the advertising sheets of Newspapers, and by hand circulars, with a view, urged by pressing necessity, of endeavouring to maintain their position with the Purchaser and Consumer of Peruvian Government Guano:—

<sup>&</sup>quot;Advertisements having lately been prominently put forward, instituting comparisons between Gennine Peruvian Grano and Artificial Manures of the like class, unfavourable to the former, and "attempting to draw it have advertised partial of the class of the class and the class of the class of

<sup>&</sup>quot; attempting to deny its long acknowledged mcrit as a fertiliser, it is essential, in the interest of con-"sumers, to make the following plain statement of facts bearing on the Money and Agricultural value of "Peruvian Government Ganao.

<sup>&</sup>quot;Various samples of Pernvian Government Gnano, taken indiscriminately from cargoes arrived during the past season, having been submitted to the eminent Analytical Chemists mentioned below,

"their several Analyses, showing the highest and lowest percentages of Ammonia and other valuable "eonstituents, with their names, are subjoined:—

|  | Mr. O    | GSTON.                                  | Dr. Li                                  | ETHEBY.                                 | Messis.<br>Way & Evans.                  |   |  |                               | ELCKER.   | Mean of the |  |
|--|----------|---|---|---|--|---|--|-------------------------------|---|-------------|--|
|  | Highest. | Lowest.                                 | Highest.                                | Lowest.                                 | Highest.                                 | Lowest.                                 | Highest.                                   | Lowest.                       | Analyses  |             |  |
| Organic matter & Ammon. Salts Insoluble Matter Earthy Phosph. Alkaline Salts Ammonia |          | 53.42<br>1.06<br>22.75<br>7.41<br>17.02 | 49.70<br>4.50<br>23.60<br>9.40<br>18.10 | 48.40<br>1.00<br>23.00<br>6.10<br>17.00 | 55.04<br>1.16<br>20.98<br>11.27<br>17.97 | 52,45<br>1,08<br>19.37<br>9.44<br>16.50 | 52.81<br>- 1.75<br>23.25<br>10.52<br>18.69 | 51.70 { 1.11 20.26 6.37 18.37 | 34.95 after deduct-<br>ing Ammonia.<br><br>22.11<br>8.38<br>17.73 |             |  |

"The money value of the above constituents of Peruvian Government Guano is estimated by Chemists 
and Manufacturers, at present prices, as follows:—

The value of the mean of the above analyses will, therefore, stand thus-

| Organic Matter (after deducting the Ammonia)         \$4.95           Earthy Phosphatos         22.11           Alkaline Salts         8.38           Ammonia         17.73 | 10    | £35<br>199<br>83 | 0<br>0<br>16 | 0<br>0<br>0 |
|---|-------|------------------|--------------|-------------|
| Money value of 100 Tons   |       | £1,877           | 16           | 0           |
| . Consequently of 1 Ton of Peruvian Government  | Guano | £13              | 16           | 0           |

"The value in money of Peruvian Government Guano being thus ascertained, its more important

"qualities and exclusive merits as a fertilizer, and its essential value to the Farmer and Agriculturist, "are placed beyond doubt by recorded experiments and published statements of men of the highest "authority and competency." Thus—

"Professor Anderson, of Glasgow, says:—"The superiority of Ganao (Perwiau) is particularly
"evident, both from Mr. Porter's and Mr. M'Larqu's experiments—the former obtaining by its use a
"produce exceeding that from Nitrate of Soda by almost exactly a fifth, and the latter by nearly a

"sixth. \* \* But Peruvian Guano produces a greater manurial effect, because it supplies "Phosphates and Alkaline Salts, in addition to Nitrogen, and hence its composition justifies the title of a

"'TRUE MANURE,' applied to it by Mr. M'Laren.'—Transactions of the Highland and Agricultural "Society, March, 1856.

"Professor Neshir, F.G.S., F.C.S., &c., of London, says:—"Of all the Artificial Manures,
"Peruvian Ganois perchaps not only the most connectated, but is from its composition adopted to the
"greatest variety of crops. The chief mineral constituents of plants—lines, nagaseius, potash, soda,
"chlorine, sulphuric acid, and phosphoric acid (the last the most important), are found in Gano.
"Narogen, the most valuable constituent of Manures, is jound in Peruvian Gunon in great abundance,

"And in a condition adapted for vegetation."

"A The experiments of Mr. Robert Monteith, of Carstairs, on Oats and on Hay—of Mr. George B.

"Ogborn, of Elbaston, Gloncesterbine, on Postatees—of Mr. Campbell, of the Botanie Gardens, Wannehester, on Grass—and of Mr. R. Osborn, of Henbury—show the enormous productive power of "the application of small amounts of Peruvian Guano to each."—Nesbit's Lectures on Agricultural "Chemistre, pp. 116, 117, 118.

"M. Kuhiman, the French Agricultural Chemist, experimenting on the action of Ammonia on grass land, proves Guano to be one of the most important manures for increasing the productive " power of our pasture and meadow land. He applied Ammonia, alone and combined, and found in "all cases the amount of grass or hay produced was in exact proportion to the amount of nitrogen "contained in the manure. Guane, containing a large amount of Ammonia, and being its cheapest "source, must prove of great benefit in the production of grass.

"MR. CAIRD says:—'Increase of produce of nine bushels per acre in 100 acres of Wheat, and of straw 10 cut, per acre, manured with Peruvian Guano at 2 cut, per acre, —Letter to the 'Times,'

" September 10, 1853.

"Mg. Lawrs, of Rothampsted, has shown that two cwt. Guano per acre give an increase of eight bashels, with no other manure applied; and in a field of 14 acres, twenty years consecutively in "heat, by increasing the application of Guano from year to year, that eminent Agriculturist has "increased its production from 20 bashels to 56 bushels per acre, and of superior quality.

"MR. CARD'S experiments in S.-W. of Scotland, and Mr. Lawes' in S.-E. of England, show that "in the climate of this country the application of 2 cwt. Peruvian Guano on duly prepared Wheat soil "will vive an increase of one quarter."

# Reply to the foregoing Statement of Thomson, Bonar, and Co.

An equally careful reading of the following Reply by the Contractors for the Phospho Guano will leave no need for remark here as to how the foregoing Statement by THOMSON, BONAR, and CO., attempting, by mere commercial calculations, to defend the money value of Peruvian Government Guano, has been successfully answered:—

It is contended that Peruvian Guano, notwithstanding much evidence to the contrary, maintains that superiority over every other Guano which it gained for itself many years ago, and before the introduction of Phospho Guano. It is a substance of great value, and probably before the discovery of Phospho Guano it had good right to the high position it claimed. What is maintained is that, if scientific and practical evidence are worthy of any credit at all, Peruvian Guano does not by any means equal Phospho Guano as a manure—a conclusion which must be arrived at by every person who investigates the subject without prejudice.

The evidence set forth in the Advertisement referred to, by Professor Anderson, Mr. Nesert, Mr. Caerd, and others, the correctness of which is readily admitted, may be passed over with a single remark, that the whole bears date from 1853 to 1856, and cannot, therefore, apply to the question at issue, as the Prospho Guano was not introduced until the year last mentioned.

It is necessary, however, to say a few words in regard to the following calculations, set forth in support of the alleged money value of Peruvian Guano:—

"The money value of the constituents of Pernvian Government Guano is estimated by Chemists and Manufacturers, at present prices, as follows:—

The value of the mean of the above analyses will, therefore, stand thus-

Consequently of 1 Ton of Pernvian Government Guano ..... £13 16. 0"

To these calculations a few exceptions may be taken.

Organic matter, for instance, is valuable only for the Ammonia it contains.

The Ammonia in the foregoing table having been deducted and valued separately, the residue, 34.95, has no money equivalent. Consequently its value, estimated at the rate of £1 per ton, must be deducted.

Again, Alkaline Salts in Peruvian Guano are, with the exception of  $1\frac{1}{2}$  per cent. of Potash, composed of common Salt, which, certainly, is not worth £10 per ton. A further sum, amounting to 15s., may, therefore, be deducted under this head.

With regard to the value claimed for 17.73 of Ammonia (should be Nitrogen, not Ammonia), attention is directed to the following quotation from the Report of the Baron Liesic:—

"The quantity of Nitrogen found in Peruvian Guano does not correspond to its equivalent of "Ammonia," The richest in Ammonia contains very seldom more than seven per cent.; the rest of the "Nitrogen is in the form of Uric Acid, Guanin, &c., of the action of which on vegetation nothing is "known."

This opinion is corroborated by Dr. Voelcker, as follows :-

"Prioseno Guxoo contains nearly the *vehole* of its Nitrogen in the form of readily available Salts of Ammonia. Peruvian Guano, on the other hand, contains the larger proportion of its Nitrogen in the form of Uric Acid, Guanian, and other infrogenous substances."

Dr. Anderson, in his Report, makes a similar statement :-

"Peruvian Guano contains a large amount of Nitrogen, partly as Ammonia and partly in the form of Uric Acid, Guanin, &c., coupled with a comparatively small quantity of Phosphates, chiefly in the "insoluble form."

Consumers, after carefully considering the above, can make their own calculations as to the money value of the Peruvian Guano.

All Chemists of standing have for some time endeavoured to show the fallacy of all mere money valuations of manure; but, for the information of persons wishing to institute comparisons as to the relative value of the two Guanos, it may be simply stated that, calculated on the same data as those adopted by the Agents of the Peruvian Government, the value of the Phospho Guano is, according to Dr. Apighn, £14 11s. 7d. per ton. These values, it must be borne in mind, are such as cannot be reduced by considerations like those brought to bear against the above valuation of Peruvian Guano. The Alkaline Salts in the Phospho Guano are chiefly Potash, and it has not a trace of common salt; while its Ammonia is actual Ammonia, not Guanin, and other substances, "of the action of which on vegetation nothing is known."

The advocates of Peruvian and Phospho are both aware that those Guanos are respectively the representatives, in the highest degree, of the two most important manurial substances, ammonia and phosphoric acid.

"In Peruvian Government Guano there is an average of 13.61 per cent. of nitrogen, only a part of which is in a condition equal to ammonia—7 per cent., the remaining part of the nitrogen is evidently only capable of yielding the balance of its equivalent of ammonia under problematical circumstances, there fore incapable of representing any definite money value, and thus, as in the case of the nitrogen in woollen rags, may be termed latent or inert ammonia."

"Now, as Peruvian Guano contains only about 7 per cent. of "ready formed" ammonia, and as five-sixths of its money value are made to depend upon its yielding from 16 to 19 per cent. of that ingredient, it is a matter of the very greatest importance to the farmer to be clearly informed whether or not all its nitrogen is equally useful. A little more than one-third of its nitrogen exists in a condition in which it is capable of being directly taken up by plants; but who can tell whether or not uric acid and guanim—the most abundant nitrogenous constituents of Peruvian Government Guano—are suitable food for plants? It may be urged that the guanin and uric acid are decomposed in the soil, and converted into ammonia; but granting such to be the case, it is hardly correct to place the same value upon ready formed ammonia as upon substances which may be capable of conversion into that substance. Woollen rags contain an amount of nitrogen equivalent to about 16 per cent. of ammonia; that is, it is capable of "yielding" that amount of ammonia during its decomposition in the soil. But would it be correct to value woollen rags in proportion to the amount of ammonia which it

is "capable of yielding?" Assuredly not; for if we were to do so the commercial price of the article would be nearly £10 per ton, whereas experience has shown its actual agricultural value to be from 30s. to £2 per Ton."

"Three things have to be ascertained before the money value of the non-ammoniacal nitrogen of Peruvian Guano can be determined. These are:—Firstly, the period of time required for its conversion into ammonia; secondly, whether or not it is capable of being directly assimilated by plants; thirdly whether it is retained by the soil in the same way that it has been proved the ammoniacal compounds are fixed therein."

"In woollen rags the nitrogen is in a totally insoluble form, and cannot be washed out of the soil; so that it remains undiminished in amount until it is converted into available ammonia."—Agricultural Review, Feb. 3rd, on Imme-

diate Availability of the Nitrogen in Peruvian Guano.

"We know no fact to prove that uric acid is converted in our soils and climate into ammonia and oxalic acid, as it is in a guano bed in a hot climate and during the lapse of centuries. What we know is that the residue of Peruvian Guano which is left after lixiviation (thorough washing) by water, and which contains the whole quantity of uric acid and a certain quantity of earthy phosphates, has little effect on vegetation—not more than may be ascribed to the phosphate,"—Liebig's Letter upon Dr. Anderson's Lecture before the Highland Society of Scotland.

# Agricultural experience of the difference between Peruvian Government Guano and Phospho Guano.

The more the general question is ventilated, as to which is the most profitable system of husbandry, with regard to the application of manure, the better it will be for those who are inclined to use artificial means to increase the produce of their estates.

Baron Lients and those who agree with him assert that the apparent success of the use of manures, chiefly nitrogenous, such as Peruvian Guano and Salts of Ammonia, has been short-lived and dearly bought at the expense of the permanent fertility of the soil and the healthy constitution of plants grown upon it, and some

go so far as to attribute many of the disasters that have befallen our cultivated plants to the injudicious use of Peruvian Guano. The potato disease, the turnip rot, nangel and sugar beet failure, have all in their turn been ascribed to its use. The morbific action of ammoniacal manures, having in their composition an excess of stimulating power, consists in the tendency to promote an undue expansion of tissue, an enlarged, but unhealthy, ill-fed plant, having an excess of water, and impoverished circulation of juices. This has tended so to weaken the constitution and tone of our cultivated plants as to render them subject to the attacks of pestilential fungi, infusoria, and animalculi. Wherever this happens the weaker plants are most liable to fall a prey to their influence.

The continued use of manures depending chiefly on nitrogen for their action must tend to degenerate vegetation, and induce a loss of tone and stamina, which may prepare the way for such visitations as have caused such desolation to the potato and turnip growers in this country, and to the beet root crops on the Continent.

The Phospho Guano contains more of the vital stimulant, combined with more solidifying and fruit-producing food, than any other manure now before the public. It contains sufficient nitrogen to form a healthy stimulus to the growth of a plant, and assist it to digest and assimilate the phosphates and other indispensable plant food it requires. These phosphates are in a condition so as, at once, to be absorbed into the frame of a plant; and from its use a farmer will get his return in proportion to the quantity applied the first season, and the land will not be left in a worse state for the succeeding crop, as must be the case where nitrogenous manures have only been applied.

Where PHOSPHO GUANO is used as the manure for potatoes, turnips, and mangels, these roots become more solid, healthy, and free from rot. On analysis they have been found to contain more nutritious food, in proportion to their size, than those grown by more nitrogenous manures, such as Peruvian Government Guano.

# Guano or Organic Phosphates versus Mineral Phosphates.

"It is not enough that there should be a certain amount of soluble and insoluble phosphate in a "manure; but that the very source from which the fertiliser is obtained affect its agricultural as well "as its commercial value."—VOLECKER.

"The former are valuable on account of having several times passed through organic life in some form; and, favoured by these alternatives in the composition and decomposition to which they have been submitted, acquire the faculty of forming the constituent parts of the vegetables which men and animals require for their support.

"The latter, or mineral, are simple primitive bodies of nature, or in a simple or primitive condition of structure, and must be subjected to those natural changes or progressive modifications before vegetation can thrive upon them, or

be enabled to absorb them.

"It is thus with all the inorganic products of nature, and it is for this reason that the phosphates which are found in organic Guanos are of so much value when used in the capacity of manure; yet the soils, which are themselves the dèbris of phosphoric rocks, and which ancient chemists considered equivalent to the phosphates contained in the excrement of birds, are of no real value unless they have been absorbed during a series of ages by inferior plants and deposited in the soil after having been submitted to decomposition and brought into the state of the phosphates which form part of the food of birds and animals. Hence the practical illustration of the value of the mineral elements of FARM-YARD MAYURE, having again and again passed through these progressive modifications and chances."

"For this reason, organic phosphatic Guanos are capable of fertilising the most sterile soils; whilst mineralphos phates, which are themselves the debris of chlorophite rocks, are only capable of such fertilising power when reduced to a similar condition of progressive modification by the operations of nature."

"The comparative value of phosphates or other mineral substances, such as are found in the composition of plants, cannot be told by analysis without first knowing whether they are of organic erigin, or have passed through organic structure. A single ton of Guano Phosphate possesses a fertilising power greater than many times its weight of mineral substances in their primitive state—the superphosphates of lime made from bones have proved in field practice their much

higher value than those made from *minerals*, though each should be rendered equally in a soluble state by sulphuric acid, and each prove to be identical in their composition by chemical analysis, simply because the *bone* phosphates are in a more peculiarly available form for entering into organic life by the absorbent power and other forces inherent in the roots of plants."

"In this question, as in all others connected with the scientific practice of agriculture, Nature, with her wonderful and wise operations and laws, indicates the vital importance of her joint counsel with that of the laboratory of the chemist."

"Although different specimens of these Phosphates resemble each other analytically, we must not conclude them to be equally assimilable; because chemistry only takes account of the quantity of the elements or substances of which they are composed."

"The following considerations completely elucidate the facts heretofore stated. The sixty-four simple bodies, which form the elements of all things, and which all proceed from the soil, where they commenced by being hidden, exist in the soil under different states. Soils are formed by the debris of rocks, and those of recent formation are incapable of assisting to maintain vegetable life except in its most elementary forms-such as lichens, mosses, &c., &c. These plants. which we see pushing themselves over the surface of the naked rocks, receive the simple bodies which enter into their organism, and which we shall find in a primitive state if we reduce them to ashes. When the lichens and mosses decay, their mineral elements are given to the soil in a state more favourable to ulterior incorporation, and in their turn can enter into the composition of a higher class of plants, which are ultimately themselves decomposed. Again, these plants leave the elements of which they are composed in a superior state to that in which they received them; and thus the result is these elements improve themselves from time to time, till they become capable of being received into animal life; consequently, we find in man nearly all the simple bodies."

"If it were even possible to nourish a being whose organism is as complicated as that of man with substances in their primitive state, it could not appropriate them. For instance, suppose a man could swallow powdered felspar containing 70 per cent. of potash, we should find the whole of the latter substance in his excrements, and not one atom would have entered into the construction of his organs. It could not be otherwise, though all the potash we find in man comes from felspathic rocks. But this potash has rum through a species of gradual revo-

lution during the development of organic life, until brought into a suitable state to become part of our bodies. The same may be said of every primitive matter that we find in nature."

"Every plant may be considered as representing a whole, in which the organic matter exercises new functions which did not belong to it before, and which are developed by the new situation in which they are placed. It is in virtue of these principles that we think the analysis of a soil is useless to farmers if it does not establish a distinction relative to the state in which the primitive matters that compose it are found. In fact, an analysis of that kind only points out to him all that a field is capable of yielding to vegetable life for an indefinite period, but giving him no means of judging the proportion suitable to a state in which it can be incorporated in his copps."

"We have been led to think that the ashes of plants of a superior order, or the products of their decomposition, are much more valuable than the same

ingredients under the form of primitive matter."-Maples.

So will it be found from the foregoing reasons that the phosphates in the Phospho Guano, having gone through, probably, millions of changes in organic structure, are more valuable in agricultural practice, or nature's laboratory, than those of the lower order of organization, or in their primitive condition, as in the case of coprolites, apatite, &c., &c., commercially known under the title of mineral phosphates.

# TESTIMONIALS.

The following are a few of the Testimonials, addressed to the Farmers' G AZETTE Office, respecting the application of Phospho Guano as a manure:—

W. Fetherstonhaugh, Esq., Carrick, Mullingar.

I have tried your Phospho Guano, beside many other artificial manures, for corn, grass, turnips, and potatoes, and have woo hesitation in saying that, at equal money's worth, it surpasses any other, and, at equal weight, would very fore coxed the very best I have tried beside to.

LIEUT.-GEN. H. HALL, C.B., Merville, Donnybrook.

The best proof I can give of my estimate of your Phospho Guano arises from the simple fact of my using it with unqualified approval for several years past in the produce of turnips, potatoes, and rape; in short, I have used no other in addition to farm-yard manure, and the result of my experience is that it about doubles the crop.

John Keating, Esq., Cabra House, Moynalty, Kells.

I have much pleasure in bearing testimony to the superior excellence of the Phospho Guano I had from you last season, as a turnip manner. I used it at the rate of 7 cwt. to the Irish acre, on very middling land, after a corn crop, without a particle of any other manner, and had from it as sound and even a crop of fair-sized turnips as I ever grew.

ROBERT IRVINE, Steward to J. D. Meldon, Esq., Coolarne, Athenry.

I have great pleasure in again bearing testimony to the value of your Phospho Guano as a manure for general crops. It has for some years past been used extensively on this farm, and has in every case given entire astisfaction—being applied to grain, grass, and potatoes, as well as to the tarnip crop. Our turnips this year are an excellent crop, and remarkably sound.

JAMES MOORE, Hon. Sec. to the Killead Farming Society, Waterside, Co. Antrim,

I have used Phospho Gunno the last two years, applied to green crops at the rate of 4 cwt, per Irish acre, in conjunction with half the usual quantity of farm-yard manure. I have tried different experiments with Phospho Gunno, which convince me of its fertillising powers. 4 cwt. of Phospho Gunno produced quite as weightly, and fir sounder, crops (potatoes particularly so) than where the full quantity of farm-yard manure was applied without Phospho. Last year I applied a small quantity to onls, and its effects were most visible. I have tried different artificial manures in a small way (including genuine Peruvina Gunno, got through reliable sources) on my stiff clay land. I believe I never got any good from any of them—except on one occasion, dissolved bones, home manufacture—but with Phospho Ganno. I have used a few tons; and, in every instance, I am highly satisfied with the results; and if the price keeps moderate, and the quality the same as I have got, it must prove a great auxiliary to tillage farmers.

WILLIAM WEBB, Esq., Creevagh House, Ballymahon.

I am quite satisfied with the result of the Phospho Guano which you sent me last spring. I have grown good swede turnips and mangels with 3 cwt. per Irish acre and farm-yard manure; also swede turnips with 7 cwt. per acre without dung, which are very nearly as heavy a crop as those on the farm-yard manure—both sound and heavy.

# SEYMOUR MOWBRAY, Esq., Killeaney, Mountrath.

I have used the Phospho Guano with the best results for the turnip and mangel crops every year since its introduction to Ireland, and shall continue to do so. I take every opportunity of recommending it to the small farmers in my neighbourhood—a class who have long been most shamefully imposed on by adulterations of all kinds.

# WM. Cosby, Esq., Farmley, Abbeyleix.

I have every reason to be satisfied with the results of Phospho Guaho as a manure for green crops. I applied it last season in the growth of potatoes, turning, mangel wurzel, and carrots, at the rate of 4 cwt. to the lish acre, with half the complement of manure I in general make use of, and I never had better or heavier crops. I fully intend to purson the same system of manuring this season.

# ROBERT ARMSTRONG, Esq., Creagh, Longford.

I applied the Phospho Guano at the rate of six cwt. to the Irish acre, upon poor soil, without any other manure, and had a good crop of swedes in return. I may mention that in applying the Phospho Guano part of a drill missed its quantum, and although the plants came up and lived, yet they were habiless.

# WM. H. HEAD, Esq., Derrylahan Park, Parsonstown.

I have much pleasure in testifying to the favourable results of the Phospho Guano Manure, obtained from yon, as far as my experience of it has gone. I have applied it both to green crops and to corn, in laying down land to gress, and have been so well satisfied with its effects that I purpose, D.V., applying it still more extensively this season.

# BARON DE ROEBECK, Gouran Grange, Naas.

I have always used about 3 cwt. of the Phospho Guano to the Irish acre, along with farm-yard manure, and found it of great service.

# JAMES M'GARRY, Land Steward to GUY LLOYD, Esq., Croghan.

I have tried your Phospho Guano with farm-yard manure last scason on turnings, to my entire satisfication. The field contains seven Irish acres, was under oats in 1862, hid off in ridges, twelve feet wide. In January, 1863, it was dug, first a single sod in each furrow, then good men, with good spades, eighteen inches long, were placed together, and dug it over fifteen inches deep. In May it was dug over as before, but laid flat. The third week in May it was cross-ploughed, harrowed, rolled, drills openeds, the manure carted out and spread, 20 tons per acre, and 5 cwt. of Phospho Guano; drills closed, rolled, 7 lbs. Skirving's improved purple-top swede turnip seed sowed per acre; all within the closed, rolled, and the seed of th

# A. BAILLIE, Esq., Demstown.

The Phospho Guano I got from you last spring I applied to potatoes, carrets, mangels, and turnips. To the potatoes I put farm-yard manure, and an after dressing of 3 cwt. of Phospho Guano to the Inserva due had a most excellent crop. To the carrots and mangel the manure was applied the same way. The carrots were a magnificent crop; but the mangel, on account of a magnet like a most magnet, yet in between the folds of the leaf, and a spoiled the growth of that crop. The turnip I applied to rate of 3 cwt. of your Phospho and 4 cwt. of superphosphate; they locked well at the beginning of the season, but on account of the very dry weather we had in June and July the manures had not quite so good a chance as they onght to have had if the weather had been a little more moist. My crops are in general good considering the season, and I am well pleased with your Phospho Guano where I had it sown on turnip last year. The cast crop was full six inches longer and full a fortnight earlier than the other part of the field.

### J. D. Meares, Esq., Mearescourt, Mullingar.

I used a ton of your Phospho Guano last season on turnips, and found it of the greatest advantage. The crop was remarkably good, and far superior to the remainder of the field, which was sown without it. I purpose using it in future.

### MARK KELLY, Steward to T. CONOLLY, Esq., M.P., Castletown, Celbridge.

I have used the Phospho Guano only with our turnip crop, at the rate of 5 cwt., with an equipate of all and 20 tons of furn-yard manner, to the firsh acen, and the yield of crop, both as season and this, has been excellent—not a blank or failure, and the bulbs well formed, sound, and good; so that I have great pleasure in bearing testimony to the great value of the Phospho Gonano as a manner, especially as the out crop (and also the grans, for the field was laid down) succeeding that used in 1852 was frat-rate both in grain and structure.

### THOMAS CHAMBERS, Esq., Estate Agency Office, Bailieboro'.

I applied the Phospho Guano I obtained from you at the rate of 4 evt. per Irish acre, with about 10 and of farm-yard manure, to white Belgian carrots and Shannon's Leinster sweeke, as far any manure reached. I was compelled to sow a small portion of turnips on the Guano alone. The whole crop was excellent. I have been using Guano and other artificial manures for the last 20 years on a small scale, and I never was better satisfied than with what I made use of last season. The field the green crop grew in was broken out of lea for cats in 1861, after being dressed with 40 barrels line per care. In 1862 it grew a good crop of flax, and was in good certle for green crop last season. I have no doubt in stating that any person giving Phospho Guano a fair trial once will continue to make use of it on every coacsion where artificial manure is required.

### H. C. Joly, Esq., Clonbologue, Kildare.

The Phospho Guano purchased from you last spring gave the most satisfactory return. We used it at the rate of 9 cwt. per Irish acre. The turnips were sowed the last week in April, and gave a magnificent crop.

### J. H. Peart, Esq., Hortland House, Kilcock.

I have great pleasure in bearing testimony to the great ntility of the Phospho Gnano as a furtilister. I used it chiefly for turnips, and as a top-dressing for eats, and the results were most attification. I have some by me which I intended to have had sown with winter vetches; but being from home, it was needeted. I shall, however, use it as a top-dressing for the vetches the first were day.

# W. King, Land Steward to the Right Hon. W. F. Tighe, Woodstock Park, Thomastown

I have much pleasure in bearing testimony to the good effects of your Phospho Guano on our green crops last season. I have also been in the habit for some years of using it at the rate of 2 cwt. per Irish acre on uponers fields for outs and barley, and have reason to be satisfied with the result. I may observe that I have used the Phospho Guano since its first introduction to Ireland by your house, and nurnose continuing to do so.

### Mr. RICHARD GERMAINE, Palatine, Carlow.

The Phospho Gnano supplied by yon proved well for every erop I applied it to; that is to say, spring wheat, potatoes, mangels, and turnips. I used half farm-yard isanum with the green crops. A great many are complaining of unsound turnips. They are perfectly sound with me.

## HENRY SCROOPE, Esq., Ballystanley, King's Co.

The Phospho Guano which I procured last year through your agency fully answered, or rather exceeded, my expectations. I used it alone for Swedish turnips in strong, heavy land, and the result was very satisfactory.

### G. G. TIPPING, Esq., Roesferry, Lisnaskea.

I had a first-rate crop of Aberdeen turnips, and a fair crop of swedos, applying at the rate of very little more than 3 cwt, of your Phospho Ganao to the Irish acre, without the addition of any other manner. The land was most carefully cultivated, but was otherwise as unpromising a piece of ground as could well be. I shall certainly obtain a fresh supply this year. I shall be satisfied with anything like the same results.

### ARTHUR W. Mosse, Esq., Ballyconra, Ballyragget.

I never at any time, or in the most favourable turnip season, had a better crop, or so good a crop, a this year. I applied four eve of the Phospho Guano, in conjunction with half a dressing of good farm-yard manner. I hope to have the pleasure of using the Guano next season, and of ordering what will smooth we wants from you.

### WILLIAM OXFORD, Esq., Carna.

I used your Phosphe Guane for the last two years, 2½ cut, to the Irish acre, with nearly three pasts of farm-yard manner, and I think it a very valuable preparation, not only for promoting the constant growth of the turnip, but also for having a telling effect on the succeeding crop of easts or harder.

### JAMES COGAN, Land Steward to the Earl of CLONNEL, Bishop's Court, Naas.

Further experience confirms the good opinion which I expressed to you some years ago of the Phospho Guano. Thave applied it to all kinds of green crops, and consider it one of the best, and consequently one of the cheepest, of our artificial fertilizers.

### WILLIAM PHILLIPS, Esq., Portarlington.

I have used your Phospho Guano with the most satisfactory results.

### C. Kino, Esq., Killucan.

I have used your Phospho Guano last year ou turnips and rape on a small scale, which proved satisfactory and productive.

### John Levins, Esq., Clonmore, Dunleer.

I have much pleasure in being able to inform you that the Phospho Guauo I got from you has fully realized my expectatious.

### Mr. ALEXANDER STRACHAN, Bosswell, Tuam.

The Phospho Guano that I got from you this year gave me, as usual, general satisfactiou.

## H. M'CANDLESS, Land Steward to Acheson Lyle, Esq., D.L., The Oaks, Co. Derry.

I have for several years been experimenting, with the view of testing the merits of the various Guanos, and I have always been able to raise the weighthest and soundest crops from Phospho Guano, purchased from Mr. MCarter. Waterside.

# Thomas Hampton, Esq., Waringstown.

I used the Gramo which I got from you on a field on which I sowed 6 barrels of flax seed, sy at the rate of 22 cut, per acre, or 15 cut, in all. The above produced 446 stones of flax, which sold at 10s. 0½d, per stone. The ground was poor com les stabble; and I attribute 20 per cent, of the produce to the use of the Guano. The Guano was harrowed in on the day before sowing the flax socil. I also used 3½ cut, per acre (frish) with my swedes, on a stiff clay field, and half farm-yard manure; they are an excellent crop of very sound turnity.

### Benjamin Bucannon, Esq., Harristown, by Newbridge,

I have much pleasure in saying that the Phospho Guano, as a manure for turnips, stands second to none, i.e., if judicionly applied. I have used it for some years, and the result exceeded my expectations. I last year was fortunate in obtaining the five pound prize offered by your firm for the best acro in the County Kildaro Agricultural Society's district, grown exclusively on Phospho Guano. I used 8 owth per acro—flyo at the time of sowing and three when the turnips were thinsed and hood, the lattor being carefully sown by the hand into the neck of cach plant, and producing the above results.

### W. M. CROTHERS, Esq., Clay, Banbridge.

I used 4 cwt. of the Phospho Guano with half farm-yard manure, per acre, and the crop of swede turnips was excellent. I also used the Phospho Guano at 6 cwt. per acre, alone, and had over 40 tons of Aborden turnips per acre.

# Rev. RICHARD W. BAGOT, Fontstown Glebe, Hon. Sec. to the Kildare Agricultural Society.

I competed successfully last year for the prize of £5 year so kindly offer to the members of the County Kildaro Agricultural Society, for the best are of Swedish turnips, grown on Phaspho Guano, without any other kind of manure. I used 8 cert. to the Irish arm, on second len (out girls etc.). I have estimated the produce by weighing two or time average drills, which shows a result of 28 tons to the arcs. The turnips are very sound and keeping well. I do not think I ever had a finer, cop of turnips.

### P. LINDSAY, Esq., Tullyhenan House, Banbridge.

I beg to state that I put the Phospho Guano I got from you over six I ish acres of ground that had previously been prepared with a light dressing of slacked line; well mixed with the earth, and in conjunction with less than half farm-yard manure. I sowed nearly all swedes, and had an excellent crop of large, sound turnips.

# JAMES BRADY, Steward to Lord Charlemont, Marino, Clontarf.

I feel much pleasure in giving additional testimony to the value of the Phospho Guano as a first-rate manure for green crops, &c. I have applied it in conjunction with a portion of firm-yard manure for upwards of five years, and need only refer to the records of the Royal Dabin Socjetys Winter Exhibitions, for the Challenge Cups and other first prizes awarded to me for the roots which were produced therefrom.

# WILLIAM CHARLETON, Steward to the Right Hon. J. W. FITZPATRICK, Lisduff, Errill, Templemore.

The Phospho Giano I purchased from you hast year gave perfect satisfaction. I believe it to be a valuable manner for both turnip and corn crops. I gave it a fair trial in 1858 against Peruvian Giano, and the result was, that the crop grown by the Phospho Giano was so superior to the crop grown by the Peruvian, that since then I have never used any Peruvian Giano. Last year myore, the light Hon. J. W. Fitspatrick, added to his demesne a large area of land, which was in a 1914 state of the property of Phospho Giano, 6 ewt. per acre for trurips, and 3 ewt. per acre for corn, without any other names whatever, and the result was, to say the least, perfectly satisfactory.

# PATRICK CONNOR, Steward to Thomas Hutton, Esq., D.L., Elm Park, Drumcondra.

As my employer, Thomas Hutton, Esq., D.L., Elm Park, Drumcondrs, has taken three first prizes for mangels, one first for kold rabs, and the first prize "for the largest and most varied collection of farm produce" at the late show of the Royal Dablin Society, I beg leave to state that invariably use about 30 tons of farm-yard manure, 4 cett. of Phospho Guano, mixed with a ton of coarse salt, to the Irish arc, for the above farm crops.

#### JOHN MUNROE, Esq., Tuam.

I think it due to you to say that the quality of your Phospho Guano was very good. Having tried it with a share of stable manue, and by itself, enables me to judge of the quality, and I found it as good as any Peruvian Guano.

# RICHARD IRWIN, Esq., Rathmill, Tulsk.

I have for a few years used Phospho Guano as a manure for my turnip crop. I found it so satisfactory that I now prefer it to any other of the portable fertilisers.

### W. B. BULWER, Esq., Athy.

I have only used the Phospho Guano as a manure for cats, at the rate of 3 ewt, to the Irish acre. It answered very well; and I believe it to be a valuable manure, and free from adulteration.

### L. W. Monahan, Esq., Castletrench, Mountrath.

I have grown a large crop of turnips (purple-top swedes) with your Phospho Guano, last season, without any other manure. The erop was up to 40 tons per Irish arcs. Some of the bulbs weighed 14 lbs, which can be seen here. I highly approve of the manure.

# G. R. Rothamson, Esq., Sallymount, Castlepollard.

I used your Phospho Guano, last scason, on oats, vetches, and turnips, and found it highly satisfactory.

# J. H. PAYEN, Esq., Upton, Co. Cork.

The best thing that I can say for the Phospho Guano is that I have, year by year, increased the quantity I use upon my farm; and now to the total exclusion of all other artificial manures (after testing all). I grow nine ares of swede turnips with it hat season exclusively, and I never had a better erop, nor have I seen much better ever grown with farm-yard and artificial manure combined. I shall, therefore, be troubling you very soon to seed mo my supply for this year.

# Archibald Johnstone, Land Steward to Miss Downing Nesbitt, Tubberdaly, Enfield.

It is some years since I tested the Phospho against the Peruvian Guano, in the growing of turnips and mangels. My experience was so much in favour of the Phospho Guano that I have used no other since. Last year I used it at the rate of 2½ ewt., in conjunction with Lawes' superphosphate and farmyard dung, and the result was 63 tons swedes per Irish acre.

### Mr. Patrick M'Donnell, Sterew, Dunleer.

The Phospho Guano which I got from your establishment proved a very efficient manure in producing crops of swedes, carrots, and potatoes, and as a manure for growing green crops should be recommended.

# THOMAS O'CONOR DONOLAN, Esq., Tylane, Tuam.

I used your Guano the last two years on rape and turnips, and feel it only instice to say it gave me entire satisfaction, particularly on the rape, which were the very finest crops I ever saw, and which was sown on well prepared oat stubble.

# EDWARD KELLY, Esq., Oakmount, Tuam.

I have used Phospho Guano I got from you this past spring in the growth of turnips and rape. With the former crop I put down half farm-yard manure, and with the latter I used it breadenst. Both crops have grown much to my satisfaction, and am happy to say that I have used it for many years with equal result.

### P. S. Dudley, Esq., Popefield, Athy.

I have been using your Phospho Guano for the last stree years, and whether applied to a earded green crop, the result has invariably been satisfactory. Such is my opinion of your Guano as a fertilizer, and so much profit have I derived from its efficacy, that I purpose using it still more extensively this season, and in underence to saw other artificial names with which I am acquainted.

### WILLIAM COOKE COLLIS, Esq., Castlecooke.

The Phospho Guano you sent me produced an admirable crop of Swedish turnips. I believe I used too small a quantity—only four cwt. per acre, but the land was fallowed and well cleaned.

### W. LEVINGE, Esq., 126, Lower Baggot-street, Dublin.

I have applied the Phospho Guano which you sent me last year to rape and oats, on my farm in the Customerah, and I consider it fully equal to the very best Peruvian Guano, which I have hitherto used; and the Phospho Guano is decidedly the cheaper of the two.

### James J. Kenly, Esq., River View, Tuam,

I am glad to be able to state that the Phospho Guano I have had from you this year has proved as good as what I have been in the habit of getting from you for the last six or eight years. I used it for turnips with the very best result.

### P. Wall, Esq., Agloragh, near Tuam.

The Guano I purchased from you last season has produced for me a good crop of rape, beyond my extention. Had I got it for my turnips, I think I would have a better crop. I hope you will have a supply of it the next season.

#### THOMAS RISHWORTH, Esq., Carnane House, Tuam.

The Phospho Guano I have every season purchased from you I have tried with turnips and rape, both with farm-yard manure and without it, and it has given me great satisfaction.

### John Duffy, Esq., Kilbannon, near Tuam.

The Guano I got from you last season, which I used with a little farm-yard manure under turnips, has given me full satisfaction.

### THOMAS SHAW, Esq., Cloncullen, Ballymahon, Longford,

I have much pleasure in stating that the Phospho Guano sent me for the last two years was very good. I recommended it to parties in the neighbourhood, and they were well pleased with it.

### DAMES WALLACE, Esq., Shandonaugh, Mullingar.

I have an excellent crop of turnips on your Phospho Guano, by applying half stable manure; say about 3 cwt. of Phospho Guano to the Irish acre.

### R. J. BRINKLEY, Esq., Fortland, Dromore West.

I prefer the Phospho Guano to any of the other fertilizers in common use; it makes turnip braird as quickly as Peruviau, and is more lasting in its effects. I have also tried it with success on grain crops.

### John Thomas-Going, Esq., Newhill House, Littleton, Thurles.

I continue the same favourable opinion of the Phospho Guano as supplied by you as I have for so many years expressed, and as further proof, I purpose not only continuing, but increasing the quantity this season.

### G. A. F. QUENTIN, Esq., Oldcourt, Waterford.

My mangel wurzel and swedes this season received, in addition to farm-yard manure, 3 owt of Phospho Gnano Per Irish acre. The nangel was not weighted, but the crop was a good one for the season. A few of the first sown drills land farm-yard nanure done applied; the crop on these drills was apparently about one-titled less than that on the remainder of the field. The swedes were not sewn until the 12th June (after veticles): they were taken my on 13th November. Perebes in different parts of the field having been carefully weighed, gave an average of 68 tons to the acre. From an experience of several years, I am so perfectly satisfield with the results arising from the application of Phospho Gnauo, in addition to farm mianure, to my land, for green crops, that I now use no other.

# A. Nolan, Land Steward to A. J. Hawkins, Esq., Leopardstown, Stillorgan.

I have great pleasure in stating that we used the Phospho Giano here in 1862 for swedes and margels, at the rate of 6 wt. per Lish sere—no other manure applied—and had an excellent crop. The Goldwig crop, wheat, was much superior in quality, and equal in quantity, and stood better than the remainder of the field, which had been manured by farm-yard manure. We also need it in 1863, at the same rate, on three acres of swedes and margels, applying to other manure, and the swedes appear to me the soundest and best shaped roots I have seen this essents.

# Mr. DAVID CLARKE, Seedsman, Clones.

I made some experiments the year before last of the value of Phospho Gano as a bone filled nanure, before I would resonmend it to my ensomers. Before the turnlys were lifted I selected three out of each erop, viz.,—those on the farm-yard manure and those on the Gano, as samples of the "sectil" for exhibition, ranging in weight from 12 to 18 lbs. After standing for three months in my shop, and with repeated handling, those on the farm-yard manure got quite soft, while those on the Phospho Gano were quite as hard and as firm as when they were taken out of the ground, which perfectly satisfied me that Phospho Gano is a first-class manure. One of my enstoners, a most intelligent young man, got a few bags from me in 1883 of Phospho Gano, and some of pure Peruvian Gano, ex Gibbs, Deight, and Co. Last year he would purchase no Peruvian Gano, but took all Phospho Gano. It is the only Ganon of I intend to sell this secro, as I have never recommended it to many person that it has not given perfect satisfaction to, not only as a manure for green erops, but as a manure for potatoes, onts, arrows, &c., and top-dressing for grass.

## Charles Dunne, Esq., Baronstown, Mullingar.

I have used the Phospho Guano, furnished me by you for the last four or five years, as a manure for both manged wursel and turning, at the rate of \$\frac{1}{2}\end{cases}, the region is one outputs of with better than half the complement of farm-yard manure usually put on, with the greatest possible success, and have no hesitation in saying though last season was generally an unfavorable one for turning. I had as good a crop as I could wish for, being fully 50 tons of swelse turning to the liths area, and consider there is no artificial manure equal to it, particularly for green crops; forwarding not only the early growth of the seeds sown, but also produces a sornal and weighty crop.

# D. R. P. Garsfield, Esq., Sunny Hill, Mallow.

I have used the Phospho Guano largely for the last two seasons, and am much pleased with it as a manure. I ton-dressed half a field of barley, laid down with grass seeds, and found the greatest difference in both crops, the manured part being nearly a double crop. My steward, who was at first incredulous, tried the Phospho Guano side by side with the Peruvian, but we could detect no difference between the crop—a result in favour of the Phospho, as being mach cheaper.

### Mr. DENIS DUNNE, Coolroe, Stradbally.

From the great growth your Phospho Gnano brought on my tarnips last year and this year, and a friend of mine also this year, a great many of my neighbouring farmers are to give you a call along with myself this spring.

### THOMAS PARKS, Esq., Ballugcastle, Carlingford.

The Phosphe Guno I got from you hat spring gave me great satisfaction. I applied it to turnis in the proportion of one half, with hief farm-yard manner, and had a vary fine crop. I also not it solely on ground out of which I had taken a crop of whiter veeless, and with the most freomble result. In this ground I sowed green-topped swedse, if the middle of June, and had a magnificent crop, which surprised every one who saw it. One of my neighbours used a few out, of it for potatoes, and he tells me that the proportion of damaged potatoes on it was much smaller than in any other part of the field. From my own experience of it, I believe it to be one of the best artificial manures we have, and, no doubt, you will receive large orders for it during the constant genson.

# Joseph Walpole Wm., Ashbrook, Ballacolla.

Having used your Phespho Guano in conjunction with farm-yard manner under my green exports of the reserval years, I thought you would like to have that the result has been every season to my qualities statistation. The first year I used it I tried it and Feurvian Ghano on tomirs, weight for weight, in every alternate drill, without farm-yard manner is ix weeks after coming m a stranger could observe the difference, the Phospho keeping the lead all through the season. The effect on the corn crop when need the previous year with farm-yard manner, at the rate of 3 cwt. per Irish acre, is very great. I had 22 bris. 8 st. of cost to the acre this season after land so used; and what convinced me of its great utility as a manner, about 20 percles in the middle of the field was omitted, and the corn crop on this spot was at least at the rate of 5 bris, to the acre short. My trump crop this season, to which Lapplied fram-yard manner and 3 cwt. of Phospho per Irish acre, was splendid, and have kept remarkably well.

P.S .- Written at the request of H. G. Perry, Rathdowney.

### ROBERT and PATRICK QUINLAN, Mangaistown, Carrick-on-Suir.

At your request, we beg to state that we have used your Phospho Grano on our last essays, turrip crop, and we feel satisfied with the result. We applied it at the rate of 8 set, per Irish acre, with half farm-yard manure. This gave us a good crop of swedes. We graw a good erop of Aberdeens on a poor stubble, without farm-yard manure, at the rate of 6 over the Frish acre,

### David Abernethy, Esq., Balloughgar, Parsonstown.

I have used the Phospho Guauo for the last four years, and during that time I have not found anything to equal it as a manure for turnips, and also for the succeeding white erop and grass.

# JOHN HENRY CROTHERS, Esq., Ballydown, Banbridge.

For the swede turnip crop, I applied the Phospho Guano I got from you last season at the rate of 4 ewt, per links ace, in enqinisation with about 20 tens farm-yard manure. Owing to the dry and crumbly nature of the ground, and about two weeks of scorching weather happening at time of singling the erop, although a very regular and a sound one, was below my average, being about 40 tens per aere. In 1862, the swedes, nufer expactly similar manuring as above, and being very carefully weighed, averaged fully 55 tons per acre. I will use 2½ cwt. of the Phospho Guano for the flax crop at time of sowing this season.

#### George F. Long, Esq., Banbridge.

I have applied the Phospho Gnano at the rate of 4 ewt. to the Irida sero, with less than half farm-yard manure, and had an excellent crop of early Flounder potatoes, which produced, at the rate of £45 per acre, and on another portion of the field where I planted Cumberland kidneys on fall farm-yard manure, without grance, although there was a fair crop, yet disease appeared so soon, and increased with such rapidity, that one-third of the crop was only saved at the middle of August. Both kinds were planted at the same time. I am of opinion that Phospho Guano, when used alone, is a preventive to disease in any root crop; and if applied largely, will pay by extra yield in any crop.

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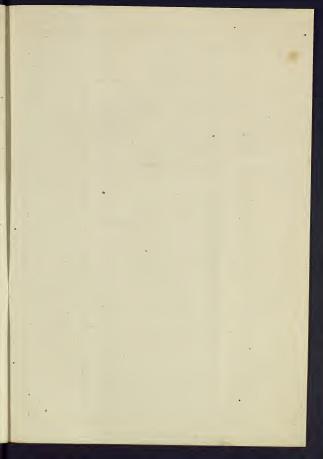
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